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Internet Protocol

From W k ped a the free encyc oped a

This article is about the IP network protocol only For Internet architecture or other protocols see Internet protocol suite

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Internet protocol suite
Application layer
DHCP · DHCPv6 · DNS · FTP · HTTP · MAP · RC · LDAP · MGCP · NNTP · BGP · NTP · POP · RPC · RTP · RTSP · RP · SP · SMTP · SNMP · SOCKS · SSH · Telnet · TLS/SSL · XMPP · *more* ·
Transport layer
TCP · UDP · DCCP · SCTP · RSVP · *more* ·
Internet layer
IP (Pv4 · Pv6) · CMP · CMPv6 · ECN · GMP · Psec · *more* ·
Link layer
ARP/ nARP · NDP · OSPF · Tunnels (L2TP) · PPP · Media access control (Ethernet · DSL · SDN · FDD · DOCS S) · *more* ·
v · t · e ·

The **Internet Protocol** (**IP**) s the pr nc pa commun cat ons protoco n the Internet protoco su te for re ay ng datagrams across network boundar es. Its rout ng funct on enab es nternetwork ng, and essent a y estab shes the Internet.

IP, as the pr mary protoco n the Internet ayer of the Internet protoco su te, has the task of de ver ng packets from the source host to the dest nat on host so e y based on the IP addresses n the packet headers. For th s purpose, IP def nes packet structures that encapsu ate the data to be de vered. It a so def nes address ng methods that are used to abe the datagram w th source and dest nat on nformat on.

stor ca y, IP was the connect on ess datagram serv ce n the or g na *Transmission Control Program* ntroduced by V nt Cerf and Bob Kahn n 1974; the other be ng the connect on-or ented Transm ss on Contro Protoco (TCP). The Internet protoco su te s therefore often referred to as TCP/IP.

The f rst major vers on of IP, Internet Protoco Vers on 4 (IPv4), s the dom nant protoco of the Internet. Its successor s Internet Protoco Vers on 6 (IPv6).[*citation needed*]

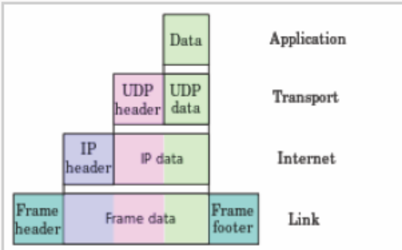
Contents [hide]

Function [ed t]

The Internet Protoco s respons b e for address ng hosts and for rout ng datagrams (packets) from a source host to a dest nat on host across one or more IP networks. For th s purpose, the Internet Protoco def nes the format of packets and prov des an address ng system that has two funct ons: dent fy ng hosts; and prov d ng a og ca ocat on serv ce.[*citation needed*]

Datagram construction [ed t]

Each datagram has two components: a header and a pay oad. The IP header s tagged w th the source IP address, the dest nat on IP address, and other meta-data needed to route and de ver the datagram. The pay oad s the data that s transported. Th s method of nest ng the data pay oad n a packet w th a header s ca ed encapsu at on.



Sample encapsulation of application data from UDP to a Link protocol frame

IP addressing and routing [ed t]

Main articles: IP address and IP forwarding algorithm

IP address ng enta s the ass gnment of IP addresses and assoc ated parameters to host nterfaces. The address space s d v ded nto networks and subnetworks, nvo v ng the des gnat on of network or rout ng pref xes. IP rout ng s performed by a hosts, but most mportant y by routers, wh ch transport packets across network boundar es. Routers commun cate w th one another v a spec a y des gned rout ng protoco s, e ther nter or gateway protoco s or exter or gateway protoco s, as needed for the topo ogy of the network.

IP rout ng s a so common n oca networks. For examp e, many Ethernet sw tches support IP mu t cast operat ons.[1] These sw tches use IP addresses and Internet Group Management Protoco to contro mu t cast rout ng but use MAC addresses for the actua rout ng.[*citation needed*]

Reliability [ed t]

Internet Protoco uses the end-to-end pr nc p e n ts des gn. Under th s des gn, the network nfrastructure s assumed to be nherent y unre ab e at any s ng e network e ement or transm ss on med um and assumed to be dynam c n terms of ava ab ty of nks and

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nodes. No centra mon tor ng or performance measurement fac ty ex sts that tracks or ma nta ns the state of the network. For the benef t of reduc ng network comp ex ty, the error-correct on nte gence n the network s most y ocated n the end nodes of each data transm ss on. Routers n the transm ss on path forward packets to the next known, d rect y reachab e gateway match ng the rout ng pref x for the dest nat on address.

As a consequence of th s des gn, the Internet Protoco on y prov des best effort de very and ts serv ce s character zed as unre ab e. In network arch tectura anguage, t s a connect on ess protoco , n contrast to so-ca ed connect on-or ented modes of transm ss on. Var ous error cond t ons may occur, such as data corrupt on, packet oss, dup cat on and out-of-order de very. Because rout ng s dynam c, mean ng every packet s treated ndependent y, and because the network ma nta ns no state based on the path of pr or packets, t s poss b e that some packets are routed on a d fferent path to the r dest nat on, resu t ng n mproper sequenc ng at the rece ver node.

Internet Protoco Vers on 4 (IPv4) prov des safeguards to ensure that the IP packet header s error-free. A rout ng node ca cu ates a checksum for a packet. If the checksum s bad, the rout ng node d scards the packet. The rout ng node does not have to not fy e ther end node, a though the Internet Contro Message Protoco (ICMP) a ows such not f cat on. By contrast, n order to ncrease performance, and s nce current nk ayer techno ogy s assumed to prov de suff c ent error detect on,[2] the IPv6 header has no checksum to protect t.[3]

A error cond t ons n the network must be detected and compensated by the end nodes of a transm ss on. The upper ayer protoco s of the Internet protoco su te are respons b e for reso v ng re ab ty ssues. For examp e, a host may cache network data to ensure correct order ng before the data s de vered to an app cat on.

Link capacity and capability [ed t]

The dynam c nature of the Internet and the d vers ty of ts components prov de no guarantee that any part cu ar path s actua y capab e of, or su tab e for, perform ng the data transm ss on requested, even f the path s ava ab e and re ab e. One of the techn ca constra nts s the s ze of data packets a owed on a g ven nk. An app cat on must assure that t uses proper transm ss on character st cs. Some of th s respons b ty es a so n the upper ayer protoco s. Fac t es ex st to exam ne the max mum transm ss on un t (MTU) s ze of the oca nk and Path MTU D scovery can be used for the ent re projected path to the dest nat on. The IPv4 nternetwork ng ayer has the capab ty to automat ca y fragment the or g na datagram nto sma er un ts for transm ss on. In th s case, IP prov des re-order ng of fragments de vered out of order.[4]

The Transm ss on Contro Protoco (TCP) s an examp e of a protoco that adjusts ts segment s ze to be sma er than the MTU. The User Datagram Protoco (UDP) and the Internet Contro Message Protoco (ICMP) d sregard MTU s ze, thereby forc ng IP to fragment overs zed datagrams.[5]

Version history [ed t]

In May 1974, the Inst tute of E ectr ca and E ectron c Eng neers (IEEE) pub shed a paper ent t ed "A Protoco for Packet Network Intercommun cat on".[6] The paper's authors, V nt Cerf and Bob Kahn, descr bed an nternetwork ng protoco for shar ng resources us ng packet sw tch ng among network nodes. A centra contro component of th s mode was the "Transm ss on Contro Program" that ncorporated both connect on-or ented nks and datagram serv ces between hosts. The mono th c Transm ss on Contro Program was ater d v ded nto a modu ar arch tecture cons st ng of the Transm ss on Contro Protoco at the transport ayer and the Internet Protoco at the network ayer. The mode became known as Internet protoco su te and nforma y as TCP/IP.

The Internet Protoco s one of the e ements that def ne the Internet. The dom nant nternetwork ng protoco n the Internet Layer n use today s IPv4; the number 4 s the protoco vers on number carr ed n every IP datagram. IPv4 s descr bed n RFC 791 (1981).

The successor to IPv4 s IPv6. Its most prom nent mod f cat on from vers on 4 s the address ng system. IPv4 uses 32-b t addresses (c. 4 b on, or 4.3×10^9, addresses) wh e IPv6 uses 128-b t addresses (c. 340 undec on, or 3.4×10^{38} addresses). A though adopt on of IPv6 has been s ow, as of June 2008, a Un ted States government systems have demonstrated bas c nfrastructure support for IPv6 (f on y at the backbone eve).[7]

IP vers ons 0 to 3 were deve opment vers ons of IPv4, used between 1977 and 1979.[citation needed] Vers on 5 was used by the Internet Stream Protoco , an exper menta stream ng protoco . Vers ons 6 through 9 were proposed for var ous protoco mode s des gned to rep ace IPv4: SIPP (S mp e Internet Protoco P us, known now as IPv6), TP/IX (RFC 1475), PIP (RFC 1621) and TUBA (TCP and UDP w th B gger Addresses, RFC 1347).

Other protoco proposa s named *IPv9* and *IPv8* br ef y surfaced, but had no aff at on w th any nternat ona standards body, and have had no support.[8]

On Apr 1, 1994, the IETF pub shed an Apr Foo 's Day joke about IPv9.[9]

Security [ed t]

Dur ng the des gn phase of the ARPANET and the ear y Internet, the secur ty aspects and needs of a pub c, nternat ona network cou d not be adequate y ant c pated. Consequent y, many Internet protoco s exh b ted vu nerab t es h gh ghted by network attacks and ater secur ty assessments. In 2008, a thorough secur ty assessment and proposed m t gat on of prob ems was pub shed.[10] The Internet Eng neer ng Task Force (IETF) has been pursu ng further stud es.[11]

See also [ed t]

- F at IP
- L st of IP protoco numbers
- Next-generat on network
- Out ne of the Internet

Information technology portal

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2. ^ RFC 1726 sect on 6 2
3. ^ RFC 2460
4. ^ S yan Karanj t *Inside TCP/IP* New R ders Publ sh ng 1997 SBN 1 56205 714 6
5. ^ Bas c Journey of a Packet
6. ^ V nton G Cerf Robert E Kahn "A Protocol for Packet Network ntercommun cat on" EEE Transact ons on Commun cat ons Vol 22 No 5 May 1974 pp 637 648
7. ^ C O counc l adds to Pv6 trans t on pr mer gcn com
8. ^ Thereg ster com
9. ^ RFC 1606 *A Historical Perspective On The Usage Of IP Version 9* Apr l 1 1994
10. ^ Secur ty Assessment of the nternet Protocol (P)(arch ved vers on)
11. ^ Secur ty Assessment of the nternet Protocol vers on 4 (Pv4)

External links [ed t]

- Internet Protoco on the Open D rectory Project
- RFC 791
- Data Commun cat on Lectures of Manfred L ndner Part IP Techno ogy Bas cs
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